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Dr. Rick Jostes, Senior Program Officer
Board on Radiation Effects Research
National Academy of Sciences, Room 640
500 5th Street, NW, Washington DC 20001

Re: NAS/NRC PAVE PAWS Committee Meeting, Woods Hole, Sept 9, 2002

Dear Dr. Jostes:

The PAVE PAWS situation is an exemplar of major long-term problems in the US Air Force's continuing failure to acknowledge the existence of a significant body of biological and biomedical knowledge relevant to radar emissions of the PAVE PAWS type. Moreover, as I shall explain, it is not inappropriate to say that, in recent times, the USAF speaks with a forked tongue in the unquestionable duplicity of its medical research policies. The concerned public may well ask, "Will the real US Air Force please stand up?"

PAVE PAWS is a pulsed radar system, transmitting packets of intense microwave energy at a low rate (approximately 19/sec, if my information is correct). The signal is intermittent, with silent periods between the signal bursts. Intensity of the emitted field remains below thresholds for tissue heating at all areas in the local environment surrounding the transmitter site. These facts must be central to any analysis of potential health risks.

For more than 20 years, the USAF has aggressively asserted that microwave fields have only one mode of biological interaction - through tissue heating. There has been a consistent denial of nonthermal interactions, and as a corollary, that tissues have no capacity to demodulate pulse- or amplitude-modulated microwave fields.

To ensure interservice conformity with this policy, a decade ago the USAF sought and obtained Pentagon approval to physically uproot the separate microwave medical research facilities of the US Army at Walter Reed Army Institute of

Research in Washington DC and the US Navy's facility at the Aeromedical Laboratory at Pensacola, FL. Their personnel and facilities were transferred to Brooks AFB in San Antonio TX.

At the same time, Brooks personnel heavily indoctrinated NATO member countries with their thermal doctrine in a series of military conferences. This may be attributed to their operation of high-powered radars at overseas locations and the pragmatic political imperative of assuring foreign governments and their populations that, on the basis of thermal models, these operations did not pose a health threat.

Brooks AFB personnel have been equally aggressive in dominating development of the US civilian safety guidelines. IEEE Subcommittee 28 is charged with preparing draft guidelines for submission to the American National Standards Institute (ANSI).

After a long career in thermoregulatory physiology at Yale University, Dr. Eleanor Adair was appointed Chief Scientist at Brooks AFB. Her views on nonthermal interactions, stated 13 years ago, have remained unchanged: ***"I've never seen one bit of scientific evidence that ELF or microwave radiation has any nonthermal biological effects. These findings are will-o'-the wisp."***
(Discover Magazine, December, 1989).

Dr. Adair became chairperson of IEEE Subcommittee 28, and appointed a significant number of like-minded scientists and engineers to the committee. **During her tenure, the committee developed position papers preliminary to completion of a draft proposal for ANSI that are dismissive of all aspects of nonthermal interactions and modulation-dependent effects, nor do they address problems of intermittent exposure or cumulative dose.**

The confirmed existence of nonthermal ELF and microwave interactions has become clear, in observations ranging from human cognitive performance and human EEG sleep records, to cell and molecular effects on gene expression, enzyme activity, and permeability of the blood brain barrier. **Though not yet conclusive, there is strong but not yet unequivocal evidence supporting modulation-dependent interactions, including alterations in human sleep EEG power spectra by pulse modulated mobile phone fields, and an absence of effects of unmodulated (CW) fields of the same average incident power.**

The USAF position on nonthermal effects is entrenched and of long standing. But the recent announcement from Brooks AFB of its plans for the Third International Electromed 2003 Conference has therefore occasioned deep surprise and mistrust of

any statements that the USAF may make re the PAVE PAWS operation. There has been a complete about-face. The Meeting Announcement reads:

Third International Symposium on Nonthermal Medical/Biological Treatments Using Electromagnetic Fields and Ionized Gases
Hosted
By
USAF Research Laboratory, Radio Frequency Radiation Branch,
Brooks AFB, Texas, June 11-13, 2003

In historic words, offered in another context, this is an incident that will live in infamy. How stupid does the USAF think that the American public must be? **If, in the eyes of the USAF, nonthermal interactions with environmental electromagnetic fields can be the basis of therapeutic interventions, why might they not occur as the result of exposure to pulsed radar fields? And what might be the health effects in consequence, for better or worse?** And what does it say about the professional integrity of the NRC Panel that it is apparently prepared to negotiate seriously with those responsible for such scientific inconsistency?

You mentioned that Dr. Roti Roti from Washington University is to be one of the invited speakers, presumably about data from an as yet unpublished long-term rat tumor study which he presented at the recent Bioelectromagnetics Society 24th Annual Meeting in Quebec City.

Biologically, that study may be flawed. Microwave exposures began in adult animals. There is a wealth of evidence that susceptibility of Fischer 344 rats to a range of chemical and physical agents capable of modifying postnatal tumor incidence, particularly of the central nervous system, is maximal in late fetal life and declines after birth.

Neither of the two types of microwave fields that he tested in this study bears the slightest relationship to the pulse modulation pattern of the PAVE PAWS field. One was a continuous wave (CW) field, with no pulse- or amplitude modulation of any kind. The other was a CDMA mobile phone field. CDMA fields employ spread spectrum techniques, occupying a large spectral bandwidth with frequency hopping across that spectrum. Their amplitude-modulation components are variable and a recent industry dosimetry report concluded that, for dosimetry purposes, a CDMA signal may also be treated as a CW signal.

It is not a parenthesis that our team has conducted in Fischer 344 rats two life-term studies correctly designed to compare effects of a true pulse-modulated mobile phone field (Adey et al., Rad. Res.152:295=302, 1999) with a frequency-modulated (FM or analog) field (Adey et al., Cancer Res. 60:1857-1863, 2000) on the incidence of both

spontaneous and chemically initiated brain tumors. Our animals began exposures during fetal life and continued into old age. Our pulse-modulated field used the North American Digital Cellular (NADC) standard, modulated at 50 Hz in Time Division Multiple Access (TDMA) modulation. The FM field used a balanced audio modulation with +12.5 KHz deviation, at the same average intensity as the digital field.

In animals receiving a single dose of the neurocarcinogen ethylnitrosourea (ENU) ***in utero*** (active time 8 minutes), exposed thereafter to the TDMA field and dying of a primary brain tumor before the termination of the experiment at 709 days, there was a significant reduction in the number of brain tumors when compared with animals receiving the ENU carcinogen alone ($P<0.015$, single-tailed).

Since we are dealing here with epigenetic actions of the fields at the cusp of the complex balance between DNA damage and DNA repair, the important conclusion is not whether tumor numbers were increased or decreased, but that there was clearly a tissue interaction with the fields. Dr. Roti Roti's study appears to have no relevance to PAVE PAWS exposures.

At this point, it may be relevant to briefly summarize my qualifications in the fields of radio physics and radio engineering. I am an elected Fellow of IEEE for my contributions in the field of radiotelemetry. Essentially unaided, I designed, built and successfully operated at my home a coherent radar system sufficiently sensitive to detect echoes of my signals from the surface of the moon (Adey, 1969). The antenna involved a 180-element steerable, multibay Yagi-phased array. The coherent detection system pioneered techniques recognized by authorities at the NASA Jet Propulsion Laboratory as the forerunner of modern broadband detection techniques.

I have responded at considerable length, because I believe deeply that your Panel has a unique obligation to science and to the public to examine competently and in detail all aspects of the PAVE PAWS situation, thereby establishing an historic benchmark. This would be in distinct contrast to the flimsy whitewashing by two recent NRC Panels dealing with comparable problems, as in the review of the NIEHS Rapid program.

With my best wishes for the success of your undertaking,

Sincerely,

Ross Adey
Distinguished Professor of Physiology
Loma Linda University School of Medicine